

WHAT IS CLAIMED IS:

1. A ladder circuit type surface acoustic wave filter device comprising:

a piezoelectric substrate;

a plurality of parallel arm resonators and a plurality of series arm resonators provided on said piezoelectric substrate, the parallel arm resonators and the series arm resonators being defined by surface acoustic wave resonators; and

a plurality of inductors respectively connected in series to said plurality of parallel arm resonators; wherein

the parallel arm resonators include a first parallel arm resonator of said plurality of parallel arm resonators connected to one of an input end and an output end of the filter device, and a second parallel arm resonator of said plurality of parallel arm resonators connected to a junction between two series arm resonators of said plurality of series arm resonators; and

said first parallel arm resonator and said second parallel arm resonator have a relationship represented by the following expression:

$$Cp1 \times 2 < Cp2$$

where Cp1 represents the capacitance of said first parallel arm resonator, and Cp2 represents the capacitance of said

second parallel arm resonator; and

the inductor of said plurality of inductors that is connected to said second parallel arm resonator has an inductance that is substantially equal to or less than the inductance of the inductor of said plurality of inductors connected to said first parallel arm resonator.

2. A ladder circuit type surface acoustic wave filter device according to Claim 1, wherein the resonance frequency of said second parallel arm resonator is lower than the resonance frequency of said first parallel arm resonator.

3. A ladder circuit type surface acoustic wave filter device according to Claim 1, further comprising:

a package containing surface acoustic wave elements in which the plurality of parallel arm resonators and the plurality of series arm resonators are provided on said piezoelectric substrate, and a plurality of electrode pads connected to the plurality of series arm resonators or the plurality of parallel arm resonators; and

bonding wires for connecting the plurality of electrode pads and the plurality of series arm resonators or the plurality of parallel arm resonators;

wherein the length of one of said plurality of bonding wires connected to said second parallel arm resonator is

substantially equal to or less than the length of another of said plurality of bonding wires connected to said first parallel arm resonator such that the inductor connected to said second parallel arm resonator has an inductance which is substantially equal to or less than the inductance of the inductor connected to said first parallel arm resonator.

4. A ladder circuit type surface acoustic wave filter device according to Claim 1, further comprising:

a package containing surface acoustic wave elements in which the plurality of parallel arm resonators and the plurality of series arm resonators are provided on said piezoelectric substrate, and a plurality of electrode pads connected to the plurality of series arm resonators or the plurality of parallel arm resonators; and

bonding wires for connecting the plurality of electrode pads and the plurality of series arm resonators or the plurality of parallel arm resonators;

wherein one end of said second parallel arm resonator is electrically connected to at least two electrode pads among the plurality of electrode pads which are connected to the ground potential such that one of the plurality of inductors which is connected to said second parallel arm resonator has an inductance that is substantially equal to or less than the inductance of another of the plurality of

inductor connected to said first parallel arm resonator.

5. A communication apparatus comprising at least one ladder circuit type surface acoustic wave filter device according to Claim 1, wherein the at least one ladder circuit type surface acoustic wave defines a bandpass filter.

6. A ladder circuit type surface acoustic wave filter device according to Claim 1, wherein the capacitance C_{p2} of said second parallel arm resonator is within a range represented by the following expression:

$$C_{p1} \times 2 < C_{p2} < C_{p1} \times 10.$$

7. A ladder circuit type surface acoustic wave filter device according to Claim 6, wherein the resonance frequency of said second parallel arm resonator is lower than the resonance frequency of said first parallel arm resonator.

8. A ladder circuit type surface acoustic wave filter device according to Claim 6, further comprising:

a package containing surface acoustic wave elements in which the plurality of parallel arm resonators and the plurality of series arm resonators are provided on said piezoelectric substrate, and a plurality of electrode pads connected to the plurality of series arm resonators or the

plurality of parallel arm resonators; and

bonding wires for connecting the plurality of electrode pads and the plurality of series arm resonators or the plurality of parallel arm resonators;

wherein the length of one of said plurality of bonding wires connected to said second parallel arm resonator is substantially equal to or less than the length of another of said plurality of bonding wires connected to said first parallel arm resonator such that the inductor connected to said second parallel arm resonator has an inductance which is substantially equal to or less than the inductance of the inductor connected to said first parallel arm resonator.

9. A ladder circuit type surface acoustic wave filter device according to Claim 1, further comprising:

a package containing surface acoustic wave elements in which the plurality of parallel arm resonators and the plurality of series arm resonators are provided on said piezoelectric substrate, and a plurality of electrode pads connected to the plurality of series arm resonators or the plurality of parallel arm resonators; and

bonding wires for connecting the plurality of electrode pads and the plurality of series arm resonators or the plurality of parallel arm resonators;

wherein one end of said second parallel arm resonator

is electrically connected to at least two electrode pads among the plurality of electrode pads which are connected to the ground potential such that one of the plurality of inductors which is connected to said second parallel arm resonator has an inductance that is substantially equal to or less than the inductance of another of the plurality of inductor connected to said first parallel arm resonator.

10. A communication apparatus comprising at least one ladder circuit type surface acoustic wave filter device according to Claim 1, wherein the at least one ladder circuit type surface acoustic wave defines a bandpass filter.

11. A ladder circuit type surface acoustic wave filter device according to Claim 2, further comprising:

a package containing surface acoustic wave elements in which the plurality of parallel arm resonators and the plurality of series arm resonators are provided on said piezoelectric substrate, and a plurality of electrode pads connected to the plurality of series arm resonators or the plurality of parallel arm resonators; and

bonding wires for connecting the plurality of electrode pads and the plurality of series arm resonators or the plurality of parallel arm resonators;

wherein the length of one of the plurality of bonding

wires connected to said second parallel arm resonator is substantially equal to or less than the length of another of the plurality of bonding wires connected to said first parallel arm resonator such that one of the plurality of inductors connected to said second parallel arm resonator has an inductance which is substantially equal to or less than the inductance of another of the plurality of inductors connected to said first parallel arm resonator.

12. A ladder circuit type surface acoustic wave filter device according to Claim 2, further comprising:

a package containing surface acoustic wave elements in which the parallel arm resonators and the series arm resonators are provided on said piezoelectric substrate, and a plurality of electrode pads connected to the plurality of series arm resonators or the plurality of parallel arm resonators; and

bonding wires for connecting the plurality of electrode pads and the plurality of series arm resonators or the plurality of parallel arm resonators;

wherein one end of said second parallel arm resonator is electrically connected to at least two electrode pads among the plurality of electrode pads which are connected to the ground potential such that one of the plurality of inductors which is connected to said second parallel arm

resonator has an inductance that is substantially equal to or less than the inductance of another of the plurality of inductors connected to said first parallel arm resonator.

13. A communication apparatus comprising at least one ladder circuit type surface acoustic wave filter device according to Claim 2, wherein the at least one ladder circuit type surface acoustic wave defines a bandpass filter.

14. A communication apparatus comprising at least one ladder circuit type surface acoustic wave filter device according to Claim 3, wherein the at least one ladder circuit type surface acoustic wave defines a bandpass filter.

15. A communication apparatus comprising at least one ladder circuit type surface acoustic wave filter device according to Claim 4, wherein the at least one ladder circuit type surface acoustic wave defines a bandpass filter.

16. A communication apparatus comprising at least one ladder circuit type surface acoustic wave filter device according to Claim 11, wherein the at least one ladder circuit type surface acoustic wave defines a bandpass filter.

17. A communication apparatus comprising at least one

ladder circuit type surface acoustic wave filter device according to Claim 12, wherein the at least one ladder circuit type surface acoustic wave defines a bandpass filter.

18. A ladder circuit type surface acoustic wave filter device according to Claim 1, wherein said plurality of parallel arm resonators includes two first parallel arm resonators.

19. A ladder circuit type surface acoustic wave filter device according to Claim 18, wherein said two first parallel arm resonators are disposed at end portions of the surface acoustic wave filter device, and said second parallel arm resonator is disposed between said two first parallel arm resonators.

20. A ladder circuit type surface acoustic wave filter device according to Claim 1, wherein the ratio of the capacitance Cp2 of said second parallel arm resonator to the capacitance Cp1 of said first parallel arm resonator is represented by the following expression:

$$Cp2/Cp1 = 5.$$